

RESEARCH SUPPORTING SOUND DECISIONS

Joint  
Fire Science  
Program



2006  
2007

PROGRESS  
REPORT

## Who We Are

The Joint Fire Science Program (JFSP) was created by Congress in 1998 as an interagency research, development, and applications partnership between the U.S. Department of the Interior and the U.S. Department of Agriculture. Funding priorities and policies are set by the JFSP Governing Board, which includes representatives from the Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, U.S. Geological Survey, and five representatives from the Forest Service.

Eric Siemer, USDA Forest Service, *Fire Management Today*



## Mission

The Joint Fire Science Program

- ◆ Provides credible research tailored to the needs of fire and fuel managers
- ◆ Engages and listens to clients and then develops focused, strategic lines of new research responsive to those needs
- ◆ Solicits proposals from scientists who compete for funding through a rigorous peer-review process designed to ensure the best projects are funded
- ◆ Focuses on science delivery when research is completed with a suite of communication tools to ensure that managers are aware of, understand, and can use the information to make sound decisions and implement projects

The Program is uniquely positioned to tailor wildland fire research in response to the emerging needs of policymakers and fire managers. An annual cycle of proposal solicitation, review, and funding ensures timely response to evolving conditions. Research projects complement and build on other federal research programs, such as those in the Forest Service Forest and Rangeland Research Stations, U.S. Geological Survey, and National Fire Plan. Synthesis of research findings and targeted delivery to managers are essential components of the Program.

More than 90 colleges and universities have also collaborated on and partnered with JFSP-sponsored research projects. By engaging masters and doctoral candidates in these projects, we are training the next generation of resource managers and scientists. This collaboration extends to private, non-profit organizations and tribal, state, county, and local governments as well. In all, nearly 200 organizations have become partners in JFSP-sponsored research.



# Research Focus



In response to congressional direction, the JFSP develops science-based knowledge and tools to support federal, tribal, state, and local agencies and their partners in the following areas:

- ◆ Fuel inventory and mapping
- ◆ Fuel treatment planning, scheduling, and risk assessment
- ◆ Fire effects and fire behavior
- ◆ Monitoring and evaluation
- ◆ Restoration of fire-adapted ecosystems
- ◆ Post-fire stabilization and rehabilitation
- ◆ Remote sensing
- ◆ Developing and integrating research information for local land managers

From 1998 through 2006, the Program has funded 380 research proposals. A highly competitive, peer-review process consisting of land managers, technical specialists, and scientists ensures the very best projects are accepted for funding. On average, about 20 percent of the submitted proposals are selected.

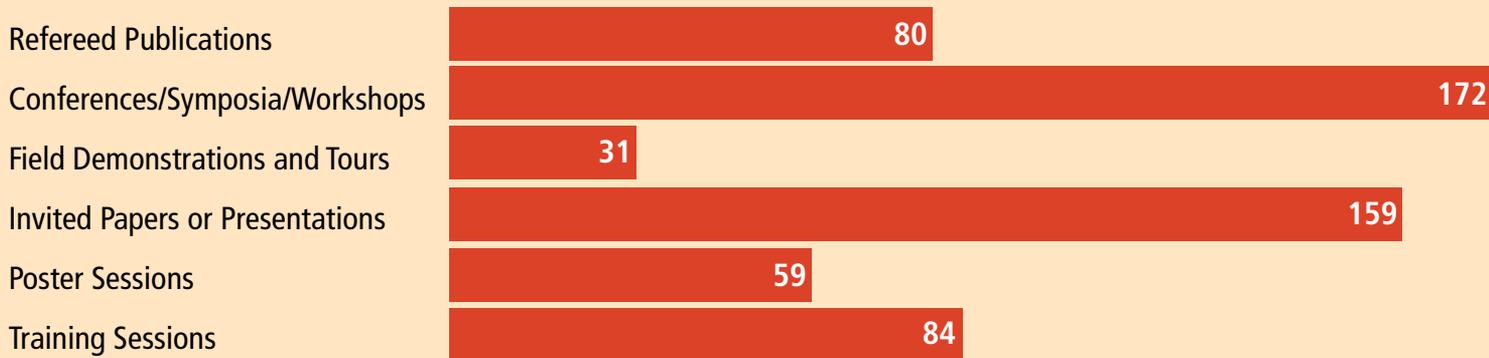
Land managers regularly use results from JFSP projects to plan and implement fuel treatments, support fire management decisions, restore lands affected by fire, and meet regulatory requirements.

The Program was funded in Fiscal Year (FY) 2006 at \$14 million. Of that amount, 96 percent went directly to new research projects at universities, federal research agencies, and other scientific institutions. The Program Office consists of a staff of four employees who provide administrative and technology transfer support.

JFSP partners also contributed approximately \$8 million and substantial in-kind resources in support of JFSP projects in 2007.

The JFSP consistently identifies and explores the most critical issues in fire and fire-related science and delivers research results in a usable format to the people on the ground who manage our forests, woodlands, shrub lands, and other natural resources for the benefit of a diverse group of agencies and, ultimately, the public.

## 2006 Program Achievements



# Listening and Soliciting Feedback



In 2006, the JFSP sought input from managers, field experts, and policymakers to determine priorities for future fire science research and synthesis. The fire community unanimously offered two key suggestions:

1. Synthesize the existing volume of information.
2. Conduct an independent examination of all key fire and fuel software and provide management recommendations.

In response to what we heard in these listening sessions, we are providing significant funding to synthesize the wealth and volume of existing science information into formats useful to decision makers.



# Roundtables for 2007

To enhance the value of its work and work products, the JFSP is sponsoring a series of roundtables on key questions in 2007. The goal is to better define and focus our future lines of work. Roundtables are facilitated, focused discussions among invited participants from the management and scientific communities. The JFSP Governing Board decided that this approach would increase the level of client involvement in identifying key information needs and potential solutions to challenges. Participants usually number fewer than 30 people. Subsequent review panels from the larger fire community ensure that all views are captured.

The management community consists of on-the-ground practitioners or managers who regularly face critical implementation or policy issues. These clients have knowledge of and can best describe what needs to be done, how long it will take, who will use the final product, and how they will use the information and management tools.

The scientific community is at the front lines of research. These scientists represent a cross-section of expertise in fire science and closely allied fields. Scientists help describe current state-of-the-art knowledge, conduct research, and identify gaps or opportunities for future research projects.

Roundtables serve as the first step toward identifying opportunities to summarize existing scientific knowledge. From there, we deliver the information managers need in formats useful for implementation, such as software programs, workshops, websites, publications, and other useful means. The discussions also help us find information gaps and answer new questions where information is lacking or has not been validated. Results from the roundtables will help frame problem analysis in topic-specific areas that will inform the JFSP Governing Board's funding decisions and influence the scope, magnitude, and direction of JFSP activities.

## Four Pressing Topics

The JFSP Governing Board will convene roundtables on the following topics:

### 1. *Fire and Fuel Models and Systems Study*

Fire and fuel managers have voiced the need for an assessment of the existing modeling and software programs. To that end, in association with Carnegie Mellon University's Software Engineering Institute, we are conducting an independent review of this critical issue. An expert strategic report will identify opportunities to develop an integrated suite of computer software for all federal land management agencies nationwide.

Key components of the analysis will allow us to:

- ◊ Evaluate existing models from the perspective of both the developer and user
- ◊ Describe consumers' needs for an integrated system
- ◊ Develop technical recommendations and a blueprint to achieve the desired integrated system
- ◊ Develop a capital investment process in support of the blueprint

We are working closely with the National Fire and Aviation Executive Board, National Wildfire Coordinating Group, and many other interested clients to provide recommendations for a fire leadership review in the spring of 2009. Without a doubt, this is the most important issue in the nation from the perspective of fire and fuel managers. The JFSP's investment in this area is \$2 million and we believe this has a huge potential for future savings in all agencies.



## 2. Risk and Appropriate Management Response

The question of risk is central to determining the placement and effectiveness of fuel treatments and gauging the ability of incident commanders and field units to respond appropriately to wildland fire incidents. In collaboration with the Wildland Environmental Threat Assessment Centers, the JFSP will convene two sessions to explore these questions:

- ❖ How do incident commanders make decisions and how can risk assessment better support those decisions?
- ❖ How do incident commanders and line officers work together to evaluate risk?
- ❖ How do field units consider risk to prioritize investments in and placement of fuel treatments?

Under current interagency policy, land and fire management plans must document strategies for appropriate management response to wildfire including the relative values at risk, such as public health, community, and ecological values. While the JFSP has already sponsored several research projects related to risk assessment, these sessions will provide a focal point for future research to address the specific needs of incident commanders and line officers.

## 3. Smoke Management and Air Quality

Frequently, the limiting factors in prescribed and wildland fire use fires revolve around smoke management issues. Critical concerns include meeting air quality standards, avoiding visibility impairment, and minimizing nuisance impacts. The current U.S. Environmental Protection Agency air quality standards for particulate matter are more restrictive. Current models for estimating emissions and particulate matter concentrations are not aligned with these restrictions. In collaboration with the Wildland Fire Leadership Council, we will convene sessions in both the eastern and western United States to explore priority research needs on this critical topic.



## 4. Biomass Removal

Biomass, such as timber, downed wood, and other organic debris, can be a value-added byproduct of treatments to reduce fire hazards and fire behavior. When managers weigh considerations such as air quality, especially near wildland/urban interface areas (WUI), harvesting biomass is seen as an increasingly useful method of fuel treatment. Two key questions will be explored:

- ❖ How do you make the decision to cut and remove biomass from a landscape compared to other fuel treatment options?
- ❖ Once a decision has been made to cut and remove biomass, what are the challenges to be faced, and what are the related research and synthesis needs?

Again, these four topics will form distinct lines of research that the Program will fund over the next several years. From all of the information that was gathered by asking fire managers their priority needs, these are the most pressing topics. The JFSP's research investments will be directed to solving these issues.



# Competitive Research

The cornerstone of the Program has been competitive research. Each year we develop new research questions aligned with our congressional direction and tailored to the needs of our fire and fuel management clients throughout the nation. Once the questions have been finalized by the JFSP Governing Board, we solicit proposals from scientists through Announcements for Proposals (AFPs).

Scientists compete for funding through a rigorous peer-review process designed to ensure the best projects are funded. The review panels consist of line officers, field managers, technical experts, and scientists who first rate each project individually. Next, each panel provides a consensus opinion and identifies which proposals should be

advanced for further consideration. Usually, the top 100 proposals are advanced for further consideration. A second review by panels consisting of Governing Board members provides further examination of the best proposals. In April of each year, the Board deliberates for several days and selects the best proposals for funding.

There is no shortage of excellent ideas to provide solutions for the problems managers face. Indeed, each year many worthy proposals cannot be funded.

The following table shows that the average cost of proposals has been rising, while Program funding has declined from \$16 million to \$12 million.

## Funding Trends

Year	Proposals Submitted	Requested Funding	Average Proposal Cost	Program Funding
2003	182	\$44 million	\$242,000	\$16 million
2004	179	\$39 million	\$218,000	\$16 million
2005	217	\$76 million	\$ 350,000	\$16 million
2006	200	\$61 million	\$ 305,000	\$14 million
2007	169	\$79 million	\$ 467,000	\$12 million

# National Level Continuing Research Projects

## Great Basin

The JFSP has supported two national-level projects over several years. These national projects could not be funded in a single year and are supported in the 2007 budget at approximately \$3 million. The first is a large-scale study of the effects of fire and other treatments on sagebrush, pinyon pine, juniper, and cheatgrass sites in the Great Basin. More information on the Sagebrush Steppe Treatment Evaluation Project is available on the Web at <http://www.sagestep.org/>.

## Community Wildfire Protection Plans

The second integrated national study evaluates the most successful, collaborative processes in developing and implementing community wildfire protection plans and enhancing social capacity. More information on Community Wildfire Protection Plans is available on the Web at <http://jfsp.fortlewis.edu/>.

In 2007, proposals focused on three key issues:

- ❖ Fire in the wildland/urban interface
- ❖ Managers' requests on pressing issues in land management agencies
- ❖ Rapid response opportunities where information can be validated on actual fires

The Governing Board met in April and selected 23 proposals totaling \$6 million. Continuing research with the Sage Biome study for the Great Basin and Community Wildfire Protection Plans accounted for an additional \$3 million. The following 2007 research questions are discussed in greater detail.

## Fire Behavior in the Wildland/Urban Interface

To most Americans, a recurring image of each fire season is the loss of homes and other structures caused by wildfires within the WUI. Estimating the potential for risk in the event of wildfire is therefore of major concern. Several available models of wildland fire behavior allow us to predict the rate of spread and other changes in behavior. These models help predict whether a fire will spread by wind-borne burning leaves or branches (spotting), how high the flames may rise, and when or whether the tops of the trees, or crown, will be consumed by fire. Other models predict the behavior of structural fires. The integration of these two types of models is still in its infancy.

The need to improve our capabilities for predicting interactions between wildland and structural fire is critical. Understanding fire behavior in the WUI will help in evaluating the impacts of domestic landscaping, design and placement of structures, local wind fields, and fire weather. It will help landowners manage their environment to minimize risk.

Increasingly, people are building new structures in natural settings. Models need to be developed that better predict fire behavior within the WUI. Armed with this information, communities can adopt new building codes and regulations that will help reduce the risk of damage throughout the nation.

The Governing Board invested over \$700,000 for two modeling projects to address this issue.

## Fire in the Wildland/Urban Interface—Society, Culture, Economy, and Aesthetics: Issues and Tradeoffs

How can individuals and communities prepare for, respond to, and adapt to or “live with” wildland fire? Communities, individual residents, and businesses must understand the costs and benefits of potential mitigation actions, including impacts on social and aesthetic values. Research on wildfire in the WUI can provide individuals and communities credible scientific information in a format that individuals can implement themselves, or that communities can adopt through formal decision-making processes.

A landscape, of course, is more than “fuel.” It is a home for people and wildlife, and a natural setting for recreation and enjoyment. Research on fire in the WUI seeks to offer individuals and communities options for fire prevention that consider aesthetics and are tailored to different climatic conditions and fire regimes. Specifically, we seek answers to these questions:

- ❖ Can we create and demonstrate model landscaping around homes and communities that is not merely fire safe, but also aesthetically pleasing and compatible with community environmental standards?
- ❖ Can we design practical planning ordinances, codes, and tools to support decision making that could be used by communities to plan for and develop a range of options for fire protection?
- ❖ What is the optimal effective defensible space for various fire regimes?
- ❖ What are the options and tradeoffs between taking shelter in one's home during a fire, known as the shelter-in-place option, versus evacuation?

The Governing Board invested over \$500,000 for two projects in this area.

Paul Ryan, J.N. Ding Darling National Wildlife Refuge, FL, *Fire Management Today*



## Managers' Request— Reestablishment of Native Vegetation after Fires on Arid Lands

Managers' requests focus on problems at the regional rather than on local landscapes. Senior management officials at the state, regional, and national levels have identified their priority information needs. The Bureau of Land Management specifically voiced the need to reestablish native vegetation as a high priority. Profound ecosystem changes within the Great Basin and other arid lands pose great challenges, as managers strive to cope with the invasion of non-native plants (e.g., cheatgrass, red brome) and woodland species such as pinyon pine and western juniper.

In 2005, over 2 million acres were burned in these ecosystems. Restoration of these areas, is a major concern for resource managers. Over \$19 million is spent annually for post-fire rehabilitation and restoration activities, yet the results often are not satisfactory. Research in this area will investigate survival and establishment rates of various species of native vegetation. This research will also establish methodologies and techniques to reestablish sagebrush, bunch grasses, and other native vegetation in arid lands in the interior western United States, such as the Great Basin, and the Mojave and Sonoran Deserts.

The Governing Board invested \$1.2 million dollars to answer critical arid lands questions.

## Managers' Request— Fire and Deep Organic Soils

Federal and state agencies manage lands dominated by woody and herbaceous plants. Some of these lands consist of ecosystems such as wetlands, black spruce forests, and peat bogs with deep organic soils. These soils form in settings where restricted drainage inhibits the decomposition of plant and animal remains, allowing organic materials to accumulate over time. As a result, deep organic soils are ecologically important because of the large quantities of carbon they contain. These soils present unique and complex challenges to fire and fuel managers, especially in Alaska, the Great Lakes States, and the southeastern United States. This research question

was developed for the U.S. Fish and Wildlife Service, but is useful to many other agencies in these regions. Our managers want to know:

- ◆ What fuel and climatic conditions are associated with transitions among varied combustion stages, meaning from ignition, smoldering, flaming, back to smoldering, and finally, to extinction?
- ◆ What are the practical means that managers can use to monitor and predict when these transitions will take place?
- ◆ How are key fire characteristics, such as burn duration, depth of burn, fuel consumption, and smoke composition (chemical and physical properties) associated with varied combustion stages?
- ◆ What are the ecological effects, such as plant and animal responses and carbon cycling, of fire in deep organic soils?

The Governing Board selected one project for an investment of \$350,000.

## Rapid Response—At Fire's Edge

Sometimes, the only way to prove ideas and models is to literally get out in front of a fire and determine whether what you thought would happen really did happen! Every year JFSP scientists confirm their discoveries during wildland fires or just after the fire has been controlled. These findings take science from the realm of theory to the real world and make a difference in planning fuel treatments, predicting fire behavior, and assessing safety for both firefighters and communities. In other words, we can verify whether the predicted effects actually occurred. In 2007, we are especially interested in projects that will:

- ◆ Validate smoke production and transport models to predict the impacts of wildland fire-generated smoke
- ◆ Evaluate the effects, effectiveness, and costs of post-fire restoration and/or rehabilitation methods
- ◆ Evaluate the effects of previous land management activities or natural disturbances—such as post-fire logging, other mechanical treatments and/or prescribed burning that removed biomass, wildfire, insect or disease infestations, ice damage, and blow-down—on fire behavior, fire severity, or fire effects.

The Governing Board invested \$1.7 million for six projects focused on post-fire erosion and treatment effectiveness for the Tripod Complex fires (Washington) and post-fire effects of the Warm Fire (Arizona).



## Taking a Good Idea to the Next Level

Research findings inevitably answer some questions, but also raise a number of new research opportunities. The JFSP, therefore, also provides funding to build on completed JFSP projects through solicitation by pre-proposals. This process often involves validating a piece of completed research and demonstrating applications to meet the needs of local managers. Sometimes it involves

developing technology transfer materials and tools to make the research information more useful. Pre-proposals also go through a peer-review process to ensure that only the best ideas are funded.

The Governing Board provided \$1.4 million in funding to expand existing work on seven projects focused on firefighter safety zones, predicting lightning risk, air quality issues, post-fire salvage logging, and erosion control modeling and software.

## Putting Information into Action

A cornerstone of the JFSP science delivery effort is summarizing science information in a format suitable for land managers. We initiated a new series of “state-of-the-science” syntheses that focus on integrating existing knowledge and interpreting research findings in terms relevant to land managers. The following publications will be supported by a rich bibliography that field personnel can use for analysis and planning to meet the requirements of the National Environmental Policy Act (NEPA). The publications will all have the same “look and feel” and be titled “*A Summary of Knowledge.*”

Based on feedback from our clients about their priorities, we began work on the following topics:

- ❖ ***Mortality from prescribed underburning*** - This synthesis will focus on the short-term effects of underburning on the large “legacy” trees that in the long-term are expected to benefit from underburning. Researchers will examine the effectiveness of alternative treatments on the survival of legacy trees during underburning for all species where data are available.
- ❖ ***“Season of Burning – Does It Matter?” Consequences and opportunities for spring versus fall burning*** - Results from the Fire and Fire Surrogate (FFS), a long-term, nationwide study to compare various fuel treatment options, and other studies will be examined to assess the effects and effectiveness of spring burning versus fall burning for fuel reduction. Effects on plants, animals, and ecological processes will be summarized and interpreted where data is available.

- ❖ ***Environmental effects of fuel reduction treatments*** - The FFS studies will provide the core data to synthesize information regarding the effects of fuel reduction treatments on wildlife and plants. The effects of fuel treatments on wildlife are often the subject of public contention, and results from field studies are fragmented. Effects will be interpreted in the context of the magnitude of fuel reduction achieved.

The Program will continue to support this urgent summarization work every year by commissioning new publications to meet the information needs of managers. As these summaries are published, the JFSP will take them directly to managers as “roadshows,” where scientists travel to central locations across the nation to offer state-of-the-art science information.

Kari Greer, NIFC, *Fire Management Today*



## Projects Completed in 2006

### Fire and Fire Surrogates – A National Study

Forests in the United States, especially those with historically short-interval, low- to moderate-severity fire regimes often have very high quantities of fuel compared to historical conditions. Widespread treatments may be needed to restore ecological integrity and reduce the risk of destructive, uncharacteristically severe fires in these forests. Much of the new work to summarize current knowledge of fuel treatment effectiveness will be based on the Fire and Fire Surrogates studies completed in 2006. These studies provide the most current science information about the consequences of alternative fuel management practices involving fire and mechanical/manual fire surrogates. More information is available on the Web at [http://frames.nbii.gov/portal/server.pt?open=512&objID=363&mode=2&in\\_hi\\_userid=2&cached=true](http://frames.nbii.gov/portal/server.pt?open=512&objID=363&mode=2&in_hi_userid=2&cached=true).

### www.firescience.gov

In spring 2007, the JFSP launched a new website aimed at land managers across the nation. Our goal is to develop a trusted source of reliable wildland fire science information—a rich store of knowledge easily accessible to the intended audience. We have developed a search engine that allows users to find information with a click of the mouse. We will continue to offer more publications and other useful information online. Our purpose is to present JFSP-funded research and to offer supporting documents on the best related information from other sources. In 2008, users will be able to customize their information needs with the addition of our shopping cart feature.

### Featured Publications

We launched three new publications series in 2007:

*Fire Science: Digest* is a 12-page summary of several related JFSP-sponsored research projects. Issues will be printed and mailed to subscribers each year and will also be published and archived online. The first issue is focused on “fire and a changing climate.”

*Fire Science: Brief* is a 4-page summary of a completed JFSP-sponsored project written to provide the reader with a quick understanding of the project.

*Fire Science: First Look* announces new research or findings hot off the press.

### Science Relevancy

*Manager's Viewpoint* is a new publication written by managers for managers. It is an opinion piece assessing whether the research is useful to managers or can be implemented on the ground.

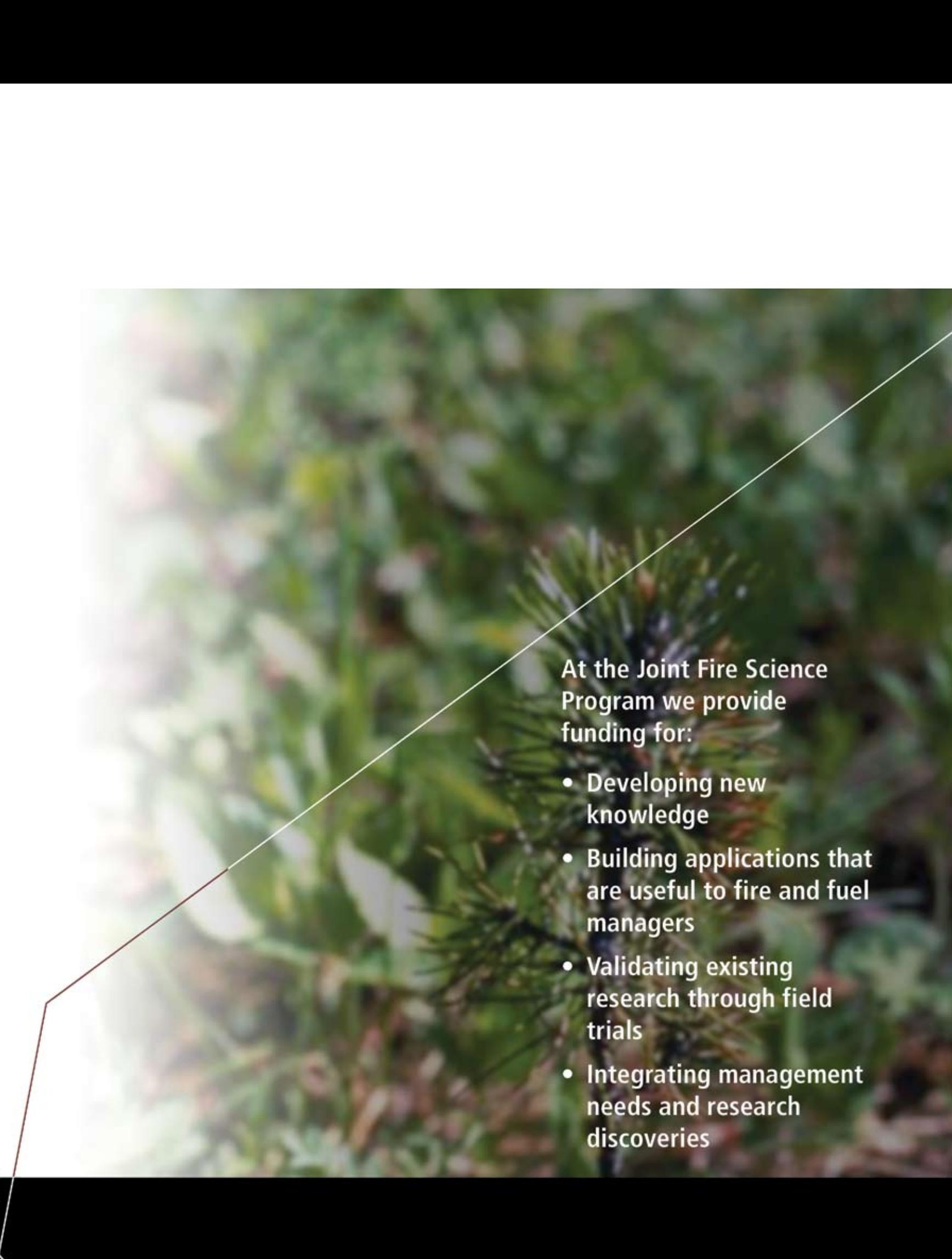
We have also commissioned an investigation of whether JFSP science information is used in the NEPA review process.

Our most important effort is to continually listen and learn about the pressing needs facing fire managers and decision makers. All of the efforts highlighted here are focused on one goal:

### *Research Supporting Sound Decisions*

Eli Lehmann, USDA Forest Service, *Fire Management Today*





At the Joint Fire Science Program we provide funding for:

- Developing new knowledge
- Building applications that are useful to fire and fuel managers
- Validating existing research through field trials
- Integrating management needs and research discoveries

# AN INTERAGENCY RESEARCH, DEVELOPMENT, AND APPLICATIONS PARTNERSHIP



Learn more about the Joint Fire Science Program at

[www.firescience.gov](http://www.firescience.gov)

John Cissel, Program Manager

208-387-5349

National Interagency Fire Center

3833 S. Development Ave.

Boise, ID 83705-5354

BLM/FA/GI-07/00249217

Production services provided by the NSTC Branch of Publishing Services

The mention of company names, trade names, or commercial products does not constitute endorsement or recommendation for use by the federal government.